

NARRATIVE

TO: Jeng-Hon Su
FROM: Eddie Gomez
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Facility Name: Hanwha Q Cells USA, Inc.
AIRS No.: 015-00150
Location: White, GA (Bartow County)
Application #: 28696
Date of Application: January 23, 2023

Background Information

Hanwha Q Cells USA, Inc. (hereinafter “facility”) is a planned synthetic minor facility located at 751 Great Valley Parkway, White, Georgia 30184 (Bartow County). Bartow County is part of the former Atlanta Ozone non-attainment area and is in attainment for all other criteria pollutants. The facility plans to manufacture 3.3 gigawatts (GW) of photovoltaic modules through three parallel assembly lines (ID No. PR01).

Solar cells are brought on-site and assembled into modules. The cells are then cleaved, and connections formed between the cells during tabbing with the aid of a flux material. The cells are laid out and the connections completed through a smoldering process. The assembly process utilizes an induction soldering method; therefore, a separate solder material is not used in the process. An Ethyl Vinyl Acetate (EVA) film and back-sheet is laminated with the solar cells. There are several quality control checks throughout the process. The edges of the modules are trimmed as needed after lamination, and the junction box is soldered to the assembled module using induction soldering. The module is framed using silicone in aluminum frames, and potting silicone is applied to protect the junction box components from corrosion. The silicone from the framing and potting processes undergoes a curing process at near ambient temperature. The solar cell modules are then sorted and packaged prior to being shipped off-site.

Emissions are expected to be generated during the tabbing, lamination, framing, and potting processes. Emissions may also be generated during the junction box soldering phase, as some silicone is applied during this process step. Dust may be generated during the junction box soldering phase as some silicone is applied during this process step. Dust may be generated during the cleaving and trimming process steps, but the dust is expected to consist of larger particles that fall to the floor and are not emitted. Most process steps are not expected to generate emissions, including laying out the cells, various quality assurance testing, and curing. Curing is not expected to generate emissions as the process occurs near room temperature, and emissions would be expected to occur during lamination, framing, or potting. The only combustion sources at the facility are the rooftop natural gas space heating units (47 units, ID No. SH01).

The primary pollutants emitted from the facility are volatile organic compounds (VOC) and hazardous air pollutants (HAP) from the assembly process.

Purpose of Application

On January 23, 2023, the facility submitted Application No. 28696 for the construction and operation of a 3.3 GW photovoltaic module manufacturing facility using three parallel assembly lines (ID No. PR01). The facility also proposed to install 47 small natural gas fired rooftop heating units (ID No. SH01).

Updated Equipment List

Table 1: Equipment List					
Emission Units				Associated Control Devices	
Production Line Code	Source Code	Description	Installation Date	Source Code	Description
PR01*	T01	Tabbing Process	2023	None	N/A
	L01	Lamination Process			
	S01	Junction Box Soldering Process			
	F01	Framing Process			
	P01	Potting Process			
	T02	Tabbing Process			
	L02	Lamination Process			
	S02	Junction Box Soldering Process			
	F02	Framing Process			
	P02	Potting Process			
	T03	Tabbing Process			
	L03	Lamination Process			
	S03	Junction Box Soldering Process			
	F03	Framing Process			
	P03	Potting Process			

* Proposed within current application

Fuel Burning Equipment

Source Code	Input Heat Capacity (MMBtu/hr.)	Description	Installation Date	Construction Date
SH01*	27.4	47 natural gas fired roof top heating units	2023	2023

* Proposed within current application

Emissions Summary**Facility-Wide Emissions**
(in tons per year)

Pollutant	Potential Emissions			Actual Emissions		
	Before Mod.	After Mod.	Emissions Change	Before Mod.	After Mod.	Emissions Change
PM/PM ₁₀ /PM _{2.5}	0	1.1	1.1	0	1.1	1.1
NO _x	0	11.7	11.7	0	11.7	11.7
SO ₂	0	0.1	0.1	0	0.1	0.1
CO	0	9.9	9.9	0	9.9	9.9
VOC	0	<100	<100	0	<100	<100
Max. Individual HAP	0	<10	<10	0	<10	<10
Total HAP	0	<25	<25	0	<25	<25
Total GHG (if applicable)	0	10,500	10,500	0	10,500	10,500

Regulatory Applicability

Federal Rules:

The facility is not subject to any New Source Performance Standards (NSPS) in 40 CFR 60.

The facility's potential to emit (PTE) levels will be capped below 25 tpy for combined HAP, and 10 tpy for individual HAP. Thus, the facility will be an area source of HAP emissions. Therefore, the facility is not subject to any of the maximum available control technology (MACT) standards in 40 CFR 63 for a HAP major source.

Note that the facility clarified that all roof top units are indirectly heated. The exhaust gas is not ducted inside the building; it is used to heat up air going inside the building. Therefore, all rooftop units meet the definition of "process heaters" in 40 CFR 60 Subpart Dc and 40 CFR 63 Subpart JJJJJ. Because process heaters are not steam generating units nor boilers, they are not subject the said NSPS and NESHAP.

The facility is not subject to any other MACT standards in 40 CFR 63 for a HAP area source, either.

Georgia State Rules:**Georgia Rules for Air Quality Control (GRAQC) 391-3-1-.02(2)(b) – Visible Emissions**

The process equipment is subject to GA Rule (b). The nature of solar module manufacturing operations are unlikely to generate high opacity emissions; therefore, compliance with the GA Rule (b) visible emission limit is expected.

Georgia Rules for Air Quality Control (GRAQC) 391-3-1-.02(2)(d) – Fuel-Burning Equipment

Since the primary purpose of the rooftop heating units (ID No. SH01) is production of thermal energy from the combustion of fuel (natural gas) with heat furnished indirectly through transfer by fluids and transmission through process walls (combustion exhaust passes as a fluid and transfer heat to air going into the building through piping/vessel walls), the rooftop units meet the definition of “fuel-burning equipment” specified in GA Rule 391-3-1-.01(cc). Thus, all rooftop units are subject to GA Rule (d) for the visible emission limits and particulate matter (PM) emission standards. Since they all burn natural gas, and natural gas is considered a clean fuel, compliance with the GA Rule (d) limits are expected.

GRAQC 391-3-1-.02(2)(e) – Particulate Emissions from Manufacturing Processes

As manufacturing processes, the equipment is subject to GA Rule (e). The Division agrees that the nature of operation of the facility will not emit much PM. Therefore, this operation will comply with the GA Rule (e) PM emission standard.

GRAQC 391-3-1-.02(2)(g) – Sulfur Dioxide

The roof top heating units (ID No. SH01) are subject to the fuel sulfur content limit specified in GA Rule (g). Since SH01 fires exclusively on natural gas, and natural gas contains minimum amounts of sulfur, compliance with the GA Rule (g) limit is expected for SH01.

GRAQC 391-3-1-.02(2)(tt) – VOC Emissions from Major Sources

The facility is located in Bartow County, and it proposed a VOC limit below 100 tpy. Per GA Rule 391-3-1-.02(2)(tt)3., the reasonably available control technology (RACT) requirements specified in GA Rule (tt) do not apply to the facility.

Permit Conditions

Condition 2.1 limits emissions of VOC to less than 100 tons per year (tpy). This allows the facility to be classified as a VOC synthetic minor source under Title V of the 1990 Clean Air Act Amendments (CAAA). The facility must track all VOC actual emissions in accordance with Conditions 7.2 through 7.5 for the three new lines.

Condition 2.2 limits the individual HAP emissions to less than 10 tpy for an individual HAP emission and less than 25 tpy for combined HAP emissions. This allows the facility to avoid being Title V major for single and combined HAP. The facility must track all HAP actual emissions in accordance with Conditions 7.6 through 7.9 for the three new lines.

Conditions 2.3, 2.4, 2.6, and 2.7 subject the facility to GA Rule (b), GA Rule (e), GA Rule (g), and GA Rule (n) respectively.

The facility demonstrated that all rooftop units meet the definition of fuel-burning equipment in GA Rule 391-3-1-.01(cc) during the processing of Application No. 28606. Therefore, Condition 2.5 subjects the facility to GA Rule (d).

During the review of SIP Application No. 28606 for a similar facility at Dalton, Georgia, the Dalton facility identified that the tabbing and lamination processes would each form formaldehyde and hydrogen fluoride that would be emitted into the atmosphere. In order to determine the forming rates of formaldehyde and hydrogen fluoride in the tabbing and lamination processes at the White facility, Condition 6.2 requires the White facility to conduct an initial performance test to establish the pound formaldehyde per kW output of product emission rate at the maximum operating capacity of the three new lines (ID No. PR01), and the pound hydrogen fluoride per kW output of product emission rate at the maximum operating capacity of the three new lines (ID No. PR01).

Upon startup, Condition 7.1 requires the facility to submit a written notification to the Division.

The White facility will have two sources of VOC emissions: VOC contained in the raw materials, which is calculated using mass balance, and formaldehyde formed in the tabbing and lamination processes, which is calculated using the formaldehyde forming rates determined in accordance with Condition 6.2. Condition 7.2 requires the facility to keep usage records of all VOC containing materials and the total kW output of products that go through tabbing and lamination of all three lines. Then Conditions 7.3, 7.4, and 7.5 contain the instruction and formulas for calculating the facility-wide actual VOC emissions that include the two sources discussed above.

Formaldehyde is considered a VOC. Thus, Condition 7.5 requires that the facility track VOC emissions with the VOC content of all consumed raw materials and with the amount of formaldehyde formed in the tabbing and lamination processes. Before the initial performance test specified in Condition 6.2 is conducted, the facility is allowed to use the formaldehyde forming rates obtained from a Hanwha's facility in South Korea. The temporary emission factors are included in Table 7.5. The facility is required by Conditions 7.3 and 7.4 to calculate facility-wide actual monthly and annual VOC emissions.

If the monthly emissions of VOC exceed 8.33 tons, Condition 7.3 requires that the facility notify the Division.

Condition 7.4 also requires the facility to notify the Division if the combined 12-month rolling total VOC emissions rate exceeds 100 tons.

Hydrogen fluoride and Formaldehyde are each considered a HAP. Thus, Condition 7.9 requires that the facility track HAP emissions with the HAP content of all consumed raw materials and with the amount of formaldehyde and hydrogen fluoride formed in the tabbing and lamination processes. Similarly, the facility is allowed to use the formaldehyde and hydrogen fluoride forming rates obtained from a Hanwha's facility in South Korea. The temporary emission factors are included in Table 7.9. The facility is required by Condition 7.7 and 7.8 to calculate facility-wide single/combined HAP emissions on a monthly and on an annual basis.

In the event that monthly emissions of a single HAP exceed 0.83 tons and/or the emissions of combined HAP exceed 2.08 tons, Condition 7.7 requires that the facility notify the Division.

Condition 7.8 also requires the facility to notify the Division if the emissions of any single HAP exceed 10 tons or if the emissions of combined HAP exceed 25 tons.

Toxic Impact Assessment

The proposed three module assembly lines will emit five Toxic Air Pollutants (TAP), Isopropanol, Tetraethoxysilane, Formaldehyde, Hydrogen Fluoride, and Hexane. The facility wide emissions of these compounds are presented in the table below.

Table 3: Facility-wide HAP/TAP PTE and MER Comparison

Chemical Name	CAS No.	Facility-wide Emissions (lb./yr.)	Minimum Emission Rate (MER) (lb./yr.)	Emissions Greater Than MER?
Isopropanol	67-63-0	109,427	114,000	No
Tetraethoxysilane	78-10-4	776	98,500	No
Formaldehyde	50-00-0	3,866	267	Yes
Hydrogen Fluoride	7664-39-3	619	284	Yes
Hexane	110-54-3	423	170,000	No

As demonstrated in the table above, the emissions of Hydrogen Fluoride and Formaldehyde are at levels which exceed the Minimum Emissions Rate (MER) thresholds. Therefore, modeling was conducted via Screen 3 to make sure the Maximum Ground Level Concentrations (MGLC) of these two TAPs were below the Acceptable Ambient Concentrations (AAC). The results of this assessment are presented in the following table.

Table 4: Screen 3 Results

Chemical Name	Long Term Averaging Period	Long Term MGLC ($\mu\text{g}/\text{m}^3$)	Long Term AAC ($\mu\text{g}/\text{m}^3$)	15-min MGLC ($\mu\text{g}/\text{m}^3$)	15-min AAC ($\mu\text{g}/\text{m}^3$)
Formaldehyde	Annual	1.00	1.10	16.6	245
Hydrogen Fluoride	24-hr.	0.497	5.84	1.64	245

Summary & Recommendations

I recommend that Permit No. 3674-015-0150-S-01-0 be issued to the facility. A Public Advisory was issued on January 25, 2023, and comments were due by February 24, 2022, no comments were received. A Public Notice was issued on March 15, 2023, and comments were due by April 14, 2023, **no** comments were received. The Stationary Source Compliance Program (SSCP) is responsible for inspections and complaints/investigations.